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13. ABSTRACT *(Maximum 200 words)*

Under the sponsorship of Office of Naval Research, an international conference on multimedia processing and systems (ICMPS) was held at Indian Institute of Technology, Chennai, India in August 2000. This report presents a summary of the conference.

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Progress Report

Technology developments in computers and communication are enabling us to handle large amount of data for processing, storage, retrieval, distribution and interpretation. In most cases the volume of data correspond to multimedia data. It is indeed a fact that human interpretation of this data shows that information content is significantly lower than what is inferred from the binary representation of data. The main reason for this is that significant and useful information is in the interaction among the individual components of multimedia data, and we do not yet known how to capture this interaction. Hence there is lot of activity around the world on how to process multimedia data for effective storage and retrieval, communication and interpretation.

It was about two years ago Dr. Rabinder Madan of the office of Naval Research (ONR), USA, had suggested to us that a conference to address some of the issues in multimedia signal processing be arranged at IIT Madras. The venue to IIT Madras was chosen as we wanted to have this conference in India to provide interaction among a large number of Indian and US scientists working in these areas.

We were able to persuade several distinguished scientists active in this area to present plenary and invited talks. Prof. Alan C. Bovik gave the plenary talk. Prof. Shankar K. Pal, Prof. Narendra Ahuja, Prof. V. Subrahmanian and Prof. Shree K. Nayar gave invited talks. In addition we received papers from leading researchers in this field from India as a well as abroad.

About 50 papers covering the important areas of multimedia namely, multimedia databases, signal processing, human machine interface and communication were presented. The papers were organized in oral and poster sessions. In the beginning of each poster session, the authors made a brief oral presentation to highlight the ideas in their posters.

Many participants from industries attended and some of them even came forward to exhibit their products at the conference. We wanted students to take advantage of this unique opportunity of listening to the distinguished speakers in the area of the multimedia processing. With this in view, only a nominal registration fee was changed for student participants. Student participation was also made possible by generous contribution from leading industries in the county. In particular, Satyam Computers, Philips software and Intel readily came forward to provide support for this conference.

As many first time participants may not be familiar with the background operation for understanding issues in multimedia processing and systems, we organized a tutorial on August13, 2000 on topics related to conference. The tutorial speakers are: Prof. Alan C. Bovik, Prof. Rama Chellappa, Prof. B. Yegnanarayana , Prof. V. Subrahmanian and Prof. S.V. Raghaven. All the tutorial speakers are well known in their respective fields of specialization. And we hope that their lectures benefited the participants.

There are many who have helped us in making this conference possible. Dr. Rabinder Madan of ONR is responsible for taking this initiative and supporting this conference. The Director of IIT Madras, Prof. R. Natarajan has readily accepted our proposal for holding the conference at IIT Madras and provided all the facilities through the ICSR, Public Relations and estate wings of Indian Institute of Technology Madras.

The advisory committee and program committee and reviewers were very helpful throughout to give us inputs on various matters. The entire conference was activity planned and supervised by the convenor Dr. Sukhendu Das of IIT Madras. He along with his colleagues and students looked after all the arrangements including the preparation of proceedings and tutorial notes. We hope all the participants will enjoy and benefit from this conference.

We have attached the table of contents and abstracts of Plenary and invited talks.

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PLENARY TALK

AM-FM Models: New Image Representation for Multimedia Applications

Prof. Alan C. Bovik,
Univ. of Texas, USA

This talk describes AM-FM models, which are applicable for several multimodal signals like speech, images video and sound. Emphasis will be on studies of applying AM-FM signals to various image applications such as, shape from FM, stereo from FM and fingerprint analysis. Other successful applications using AM-FM models are speech signal analysis, image compression, texture synthesis and biomedical image analysis.

Invited talk 1

Algebras for Multimedia Presentations

Prof. V. Subrahmanian,
University of Maryland, USA.

Over the last few years, there has been a tremendous increase in the number of interactive multimedia presentations prepared by different individuals and organizations. These run the gamut from PowerPoint presentations to sophisticated presentations built using tools like Director and/or ToolBook. Yet, to date, the need to query archives of such multimedia presentations has barely been recognized. This talk describes an algebra called multimedia presentation algebra (MPA) for querying databases consisting of multimedia presentations created by individuals as well as for constructing new presentations from existing ones. In contrast to the relational algebra, MPA must operate on trees whose branches reflect different possible playouts of a family of presentations. We define selection, projection, join, merge, union, intersection and difference operations for such databases, and develop sound and complete algorithms for implementing these operations. We prove a host of equivalence results for queries in this algebra which may be used to build query optimizers for interactive presentation databases.

Invited talk 2

Interactive Object selection in Images

Prof. Narendra Ahuja,
University of Illinois, Urbana, IL, USA.

This talk is concerned with user-friendly selection of image regions that correspond to objects of interest to a user. There are two stages to such selection. First, a multiscale image segmentation is performed that identifies all salient regions present in an image regardless of their geometry and contrast. These regions are viewed as primitives from which any object of interest in the image could be composed. Second, a user friendly interface is developed that involves specification of the desired object by the user drawing a rough sketch around the object. This evokes an initial object selection as the union of those image segments best matched with the user sketch. If necessary, the user then improve the precision of the selection by drawing a sequence of refinement sketches that iteratively add or subtract parts from the initial selection. The interface also allows simultaneous selection of multiple objects that are not connected. The result is that the user can delineate objects having intricate boundaries without requiring much skill or dexterity with pointing devices.

Invited talk 3

Machine Intelligence, Data Mining and Soft Computing: Concepts, Features and Challenges

Prof. Sankar K. Pal,
ISI, Calcutta, INDIA

A core concept of grouping various advanced technologies with the task of pattern recognition and machine learning is, first of all, explained. The need for data mining, embedded in knowledge discovery process, in terms of pattern recognition components is then illustrated. This includes the task of rule generation, and rule evaluation criteria. The relevance and characteristics of various soft computing tools, e.g., fuzzy logic, neural networks, genetic algorithm, rough sets, both individually and in combination, are stated in this regard. A way of integrating them for efficient modeling is described. This is followed by a discussion on various challenging research problems. The lecture concluded with explaining the role of case based reasoning in the said framework.

Invited talk 4

Unconventional Vision Sensors

Prof. Shree K. Nayar,
Columbia University, USA.

What can be perceived by a human or computed by a machine from an image is fundamentally restricted by the captured data. Current imaging systems are limited in spatial resolution, field of view, and dynamic range. In this talk, we present new vision sensors that provide unconventional forms of visual information. The first part of the talk focuses on the use of catadioptrics (lenses and mirrors) for capturing unusually large fields of view. We describe several methods for obtaining single viewpoint and multi-viewpoint images. The second part of the talk addresses the problem of acquiring high dynamic range images using a low dynamic range detector. We present two approaches for extracting the desired extra bits at each pixel; the first one uses multiple images while the second uses just a single image. Several interactive demonstrations of our results will be shown. These results have implications for digital imaging, immersive imaging, image based rendering, 3D scene modeling, and advanced interfaces.